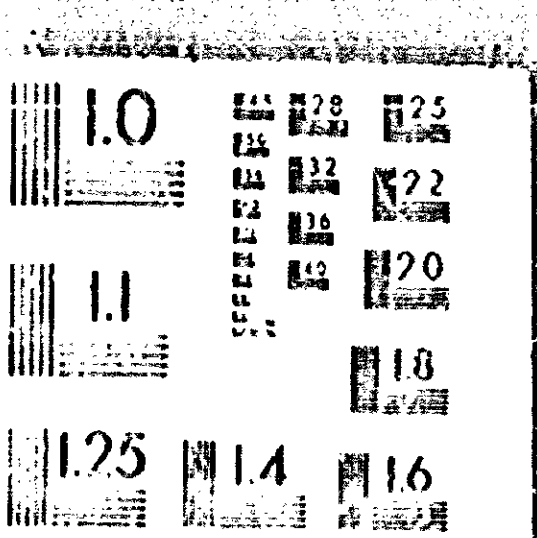

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Safety Report on the Progress of Safety Modification of Railroad Tank Cars Carrying Hazardous Materials

(U.S.) National Transportation Safety Board, Washington, DC

13 Sep 79

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

SAFETY REPORT

ON THE PROGRESS OF SAFETY MODIFICATION OF RAILROAD TANK CARS CARRYING HAZARDOUS MATERIALS

NTSB-SR-79-2

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

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16. Abstract

As a direct result of Safety Board efforts, the Department of Transportation in 1978 adopted an accelerated schedule for retrofitting tank cars carrying hazardous materials with safety equipment to protect against tank-head puncture and thermal rupture in accidents. One of the Safety Board's safety objectives during FY 1979 was to monitor the retrofit program to see that the safety modifications are completed as soon as possible. Review and monitoring of the tank car safety retrofit program indicate that:

(1) The shelf coupler retrofit for DOT 112/114 tank cars was virtually completed within 6 months of the announcement of the accelerated schedule,

2) Headshields are not being retrofitted as rapidly as possible,

3) As a result of retrofit problems and the structure of the regulations, headshield installations on more than 1,000 tank cars may be delayed up to 1 year,

4) Shelf couplers and/or headshields performed effectively in protecting against tank-head puncture in two derailments investigated by the Safety Board in FY 1979.

5) On one recommendation, the Department of Transportation has exceeded the statutory time limit on responding to Safety Board recommendations. (continued on next page)

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ABSTRACT CONTINUED

6) The Federal Railroad Administration agrees that DOT 105 tank cars should also be equipped with shelf couplers, but is unnecessarily delaying rulemaking action.

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FOREWORD

The mission of the National Transportation Safety Board is to improve transportation safety. This is done primarily by determining the probable cause of accidents through direct investigations and public hearings, and secondarily through staff review and analysis of accident information, through evaluations of operations, effectiveness, and performance of other agencies, through special studies and safety investigations, and through published recommendations and reports.

Since its establishment, the Safety Board has been concerned that solutions to certain safety problems of national significance have not been implemented as rapidly as possible, even though the solutions were known, feasible, and timely. Therefore, beginning in fiscal year 1979, the Safety Board has identified problem areas in which preventive measures are needed, targeted Safety Objectives in these areas, and aggressively pursued implementation of improvements.

One of these Safety Objectives during fiscal year 1979 was to ensure that safety modification of tank cars which carry hazardous materials is accomplished as soon as possible. This Safety Report describes the progress made toward accomplishment of tank car safety improvements, outlines efforts of the Safety Board to stimulate action by other agencies, and identifies remaining problems and issues.

With this Safety Report the Safety Board introduces a new reporting category which enhances the reporting of the Board's safety oversight and accident prevention activities, such as its safety objective efforts. Safety Reports will be issued periodically to provide the public, as well as public and private officials, information on significant transportation problems, issues and activities.

This Safety Report is issued pursuant to Section 304(a)(3) of the Independent Safety Board Act of 1974 (49 USC 1901), which provides that "The Board shall issue periodic reports. . . advocating meaningful responses to reduce the likelihood of recurrence of transportation accidents."

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20594

SAFETY REPORT ON THE PROGRESS OF SAFETY MODIFICATION OF RAILROAD TANK CARS CARRYING HAZARDOUS MATERIALS

Adopted September 13, 1979

BACKGROUND

Until the late 1950's, liquefied petroleum gases and other hazardous materials were transported by rail in 11,000-gallon nominal capacity tank cars, now known as DOT Specification 105A (DOT 105A) tank cars. In 1958, however, specification changes were allowed which permitted the use of "jumbo" (DOT 112A/114A) hazardous materials tank cars having a nominal capacity of 33,000 gallons--a 200-percent increase over the DOT 105A tank cars. In spite of their larger capacity, important safety features included in the DOT 105A tank cars, such as steel-jacketed insulation and a "center sill" for structural strength, were not applied to the DOT 112A/114A tank cars.

Between 1968 and 1979 DOT 112A/114A tank cars were involved in numerous serious accidents. (See Table 1.) In many of the accidents, couplers disengaged and overrode each other, puncturing the "heads," or ends, of tank cars. Punctured tank cars carrying liquefied petroleum gas (LPG) exploded and fire erupted, resulting in death, injury, and extensive property damage. In some cases, the intense heat from blazing tank cars caused other tank cars to erupt in "Boiling Liquid-Expanding Vapor Explosions" (BLEVE's), in which huge sections of steel tank weighing several tons rocketed to distances up to one-half mile. Punctures of tank cars containing other hazardous chemicals resulted in releases of toxic gases which were carried over surrounding areas by wind currents. In one case, a cloud of toxic anhydrous ammonia was tracked by radar to a distance of 9 miles from an accident site before it dissipated.

Jumbo tank cars carrying hazardous materials added a new dimension to train accidents. In other types of train accidents, excluding collisions with motor vehicles at grade crossings, the consequences generally are extremely localized and often confined to railroad property. Tank car accidents were of a much broader and often unpredictable scope. Their consequences were not limited to railroad employees and property, but affected surrounding communities as well. Industries, businesses, and homes were damaged or destroyed and unsuspecting citizens were injured or killed.

TABLE 1.

MAJOR RAILROAD HAZARDOUS MATERIALS ACCIDENT REPORTS ADOPTED BY THE NATIONAL TRANSPORTATION SAFETY BOARD

DATE	LOCATION	REPORT NUMBER	REPORT DATE
01/01/68	Dunreith, Indiana	68-R-2	12/18/68
01/25/68	Laurel, Mississippi	68-R-4	10/06/69
02/16/69	Crete, Nebraska	NTSB-RAR-71-2	02/24/71
06/28/69	Glenn Dale, Maryland	NTSB-RAR-70-1	06/10/70
09/11/69	Glendora, Mississippi	NTSB-RAR-70-2	08/19/70
06/21/70	Crescent City, Illinois	NTSB-RAR-72-2	03/29/72
10/08/70	Sound View, Connecticut	NTSB-RAR-72-1	12/22/71
10/19/71	Houston, Texas	NTSB-RAR-72-6	12/13/72
01/23/72	East St. Louis, Illinois	NTSB-RAR-73-1	01/31/73
05/24/73	Benson, Arizona	NTSB-RAR-75-2	02/26/75
02/12/74	Oneonta, New York	NTSB-RAR-74-4	10/17/74
07/19/74	Decatur, Illinois	NTSB-RAR-75-4	04/10/75
09/06/74	Wenatchee, Washington	NTSB-RAR-76-1	02/02/76
09/01/74	Mustang, Oklahoma	NTSB-RAR-75-6	05/07/75
09/21/74	Houston, Texas	NTSB-RAR-75-7	05/21/75
09/01/75	Des Moines, Iowa	NTSB-RAR-76-8	08/30/76
05/16/76	Glen Ellyn, Illinois	NTSB-RAR-77-2	03/31/77
11/26/76	Bolt, Montana	NTSB-RAR-77-7	09/29/77
11/09/77	Pensacola, Florida	NTSB-RAR-78-4	07/20/78
02/22-78	Waverly, Tennessee	NTSB-RAR-79-1	02/08/79
02/26/78	Youngstown, Florida	NTSB-RAR-78-7	11/09/78
03/29/78	Lewisville, Arkansas	NTSB-RAR-78-8	12/07/78

OTHER RELATED REPORTS

TITLE	REPORT NUMBER	REPORT DATE
1. "Analysis of Proceedings into Derailments and Hazardous Materials - April 4-6, 1978."	NTSB-SEE-78-2	08/23/78
2. "Safety Effectiveness Evaluation of the Federal Railroad Administration's Hazardous Materials and Track Safety Programs."	NTSB-SEE-78-2	03/08/79

SAFETY BOARD ACTIONS TO STIMULATE SOLUTIONS

In 1969, following a disastrous accident at Laurel, Mississippi, the Safety Board first called attention to the serious problem of head punctures of tank cars by overriding couplers. As a result of that accident, the Safety Board made recommendations which addressed coupler design and called for a program to develop technical improvements to hazardous materials tank cars. Following the Laurel accident, the Association of American Railroads, in cooperation with the Railway Progress Institute, formed a tank car research committee which developed a research and test project. As a result, in 1971 the committee recommended installation of tank car headshields and in 1972 and 1973, recommended installation of "shelf couplers" to prevent overriding. (See figures 1 and 2.)

In 1974 the Department of Transportation issued regulations requiring that all DOT 112/114 hazardous materials tank cars be equipped with headshields by December 1977. The regulations were challenged in court by some shippers, tank car owners and lessors, and though the challenge was unsuccessful, the retrofit program was effectively blocked.

On April 10, 1975, the Safety Board recommended that the Federal Railroad Administration (FRA) determine the capabilities of headshields and shelf couplers, or a combination of both to prevent puncture during override, and issue regulations requiring installation of the best practical combination on DOT 112A/114A tank cars. In 1975, after further testing was conducted at Department of Transportation's Transportation Test Center, FRA, the Association of American Railroads, and the Railway Progress Institute agreed that a combination of shelf couplers and headshields provided the best protection. By mid-1976, however, the Department of Transportation had not yet issued the necessary regulations.

In order to impress the urgency of the situation upon the Department of Transportation, the railroads, and tank car builders and to overcome the apparent impasse on application of safeguards, the Safety Board called a meeting of interested parties on September 20, 1976. As a result of that meeting, on November 19, 1976, the Department's Materials Transportation Bureau (MTB) issued a Notice of Proposed Rule Making (NPRM) on shelf coupler, headshield, and thermal insulation requirements for new and existing DOT 112A/114A tank cars. 1/ On September 15, 1977, the requirements were issued as a final rule which established the following deadlines for installation:

1. For all DOT 112/114 tank cars, installation of shelf couplers by July 1, 1979 (conversion to revised DOT Specification 112A/114A).

2. For DOT 112/114 tank cars used to transport anhydrous ammonia, installation of headshields over a 4 year period ending on December 31, 1981 (conversion to new DOT Specification 1128/1148).

1/ Under internal Department of Transportation procedures, FRA is responsible for developing the substantive requirements of hazardous materials regulations which apply to railroad equipment; MTB is responsible for reviewing and issuing the regulations; and FRA is responsible for enforcing them.

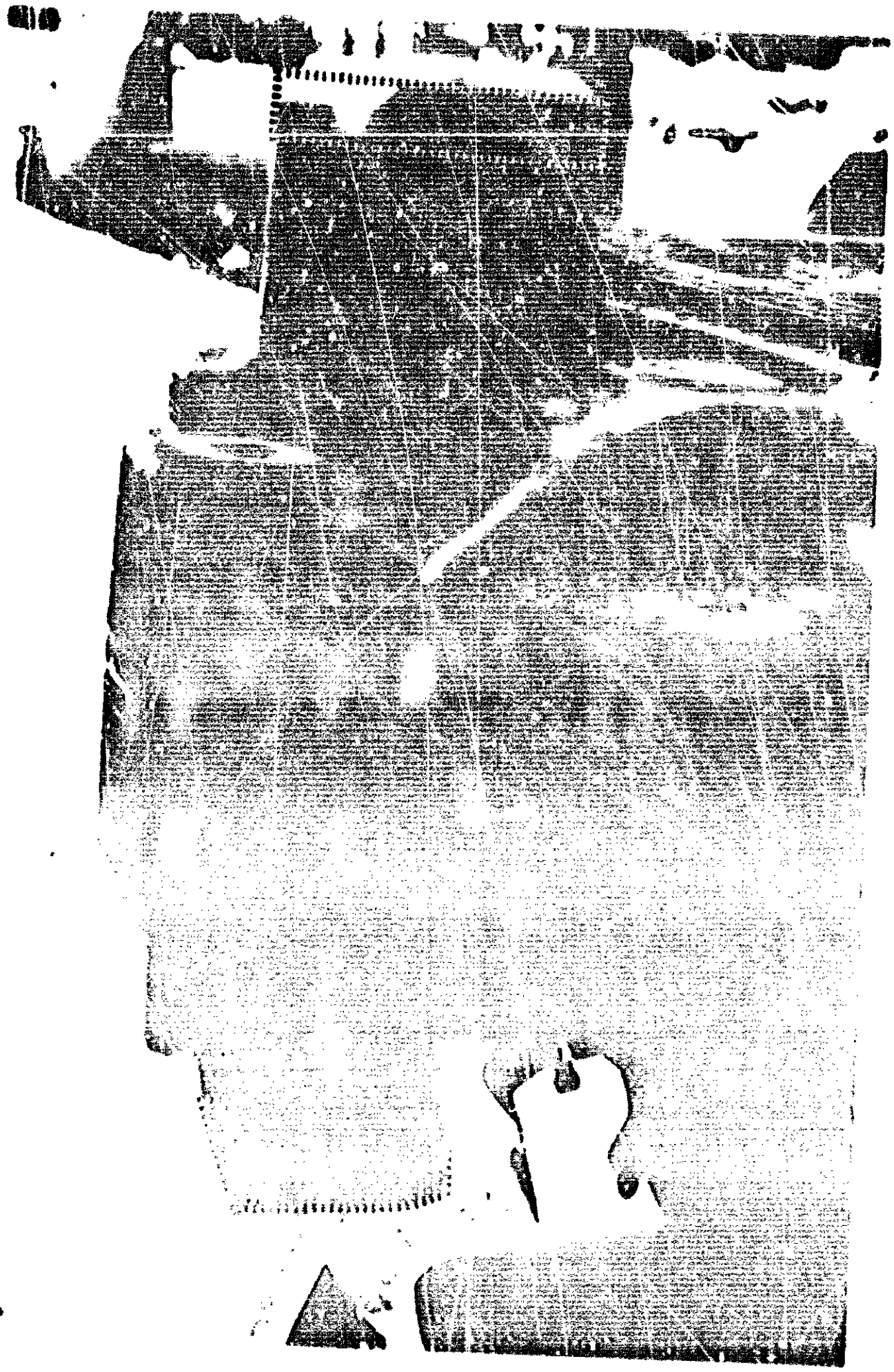

Figure 1. A shelf coupler. Shelves (outlined) at top and bottom of coupler are designed to resist vertical separation in accidents.

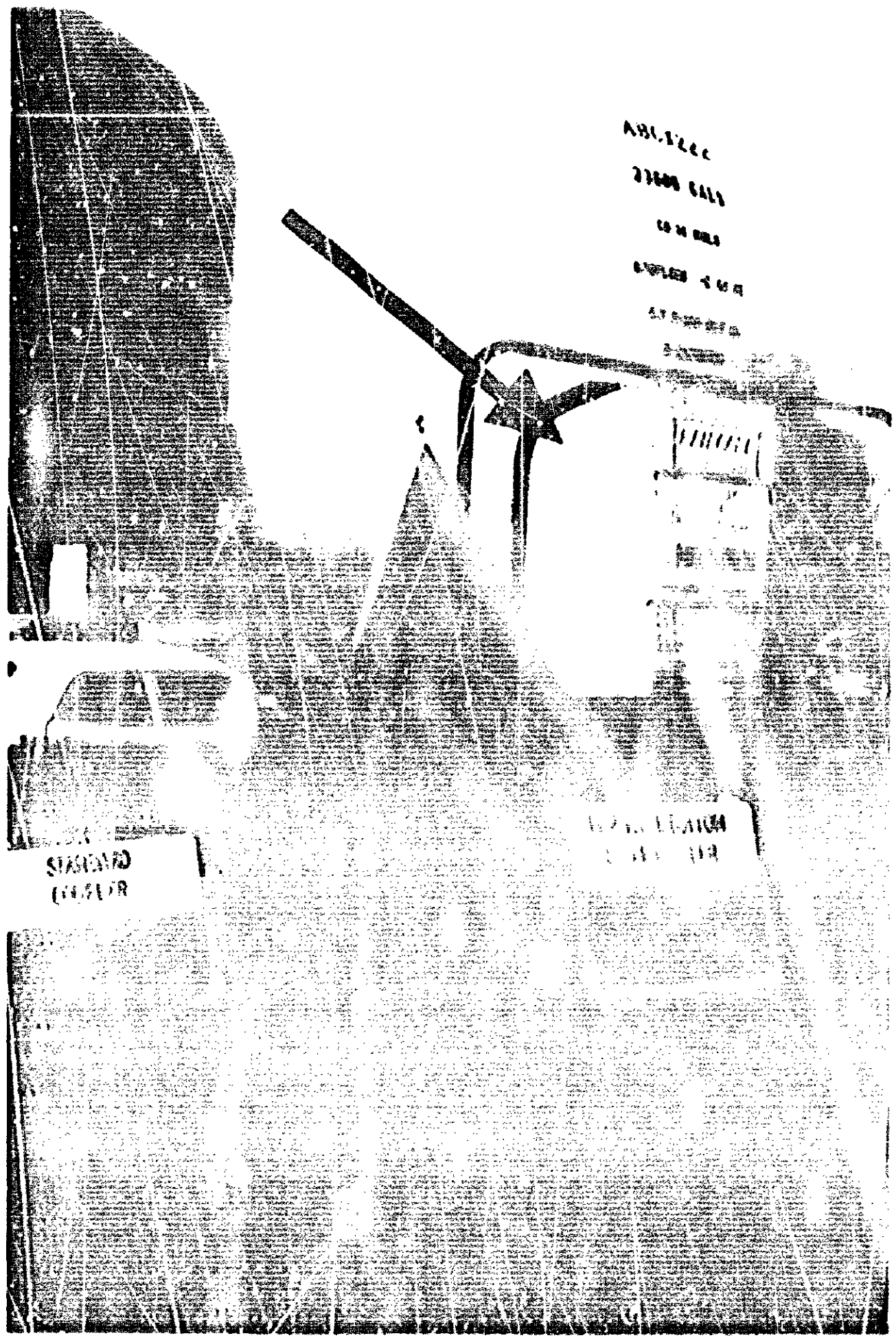

Figure 2. A headshield (arrow) and shelf coupler installed on the end of a model tank car to provide protection against tank-head puncture.

3. For DOT 112/114 tank cars used to transport flammable gases, installation of thermal insulation and headshields over a 4-year period ending on December 31, 1981 (conversion to new DOT Specification 112T/114T or 112J/114J).

MTB observed in its rulemaking notice that since 1969, more than 500 DOT 112/114 tank cars had released hazardous materials. The derailments resulted in 20 deaths, 855 injuries, and 45 major evacuations of 40,000 persons. Four of the accidents resulted in estimated property losses of more than $100 million.

In the 6 months following the issuance of the final rule, however, three train derailments involving release of hazardous materials from tank cars (including one DOT 105 tank car) killed 23 persons, injured 205, and resulted in $3.5 million in property damage. In addition, more than $670 million in claims were filed as a result of the accidents.

In March 1978, hearings on tank car safety were held in both Houses of Congress. The Subcommittee on Transportation and Commerce of the House Interstate and Foreign Commerce Committee highlighted this problem in hearings on March 15 and 16, in connection with the railroad safety authorization for fiscal year 1979, and the Subcommittees on Federal Spending Practices and Open Government and on Civil Service and General Services of the Senate Governmental Affairs Committee held hearings on March 29 on Rail Transport of Hazardous Materials. These oversight hearings, for the first time, focused national attention on the problems and solutions to tank car safety and set the stage for the Safety Board's subcequent intensified efforts to assure that the Congressional concerns expressed at those hearings were responded to as rapidly as feasible. The Safety Board indicated in its testimony that, with a sustained effort, the shelf coupler retrofit could be completed 6 months sooner than scheduled, and that the headshield retrofit could be completed 3 years sooner than the completion date specified in MTB's final rule.

On April 4, 1978, the Safety Board convened a National public hearing on derailments and the safe rail transportation of hazardous materials. The Safety Board was particularly concerned about the recent series of tank car disasters and the need to accelerate the tank car retrofit program. At the hearing, FRA witnesses testified that the combination of headshields and shelf couplers could reduce tank-head punctures by as much as 90 percent.

Following the public hearing, the Safety Board on April 24, 1978, issued three recommendations to the Secretary of Transportation urging adoption of more prompt completion dates for the retrofit program. In response to the Safety Board's hearing and recommendations, MTB on May 4, 1978, issued proposed rulemaking amendments which would accelerate the retrofit program. On June 23, 1978, the Safety Board issued a report of its public hearing, "Analysis of Proceedings of the National Transportation Safety Board Into Derailments and Hazardous Materials, April 4-6, 1978" (Report No. NTSB-SEE-78-2). The Safety Board's major findings, including its assessment of MTB's revised retrofit schedule, were as follows:

"DOT 112A/114A tank cars which transport flammable gases and enhydrous ammonia were designed by the tank car and railroad industries in order to maximize economies on the railroad transportation system. No specific safety methodology to determine unreasonable risk to the public was employed.

"When the DOT 112A/114A tank cars were accepted on special permit, the safety features of thermal insulation and a center sill were eliminated and the capacity of DOT 112A/114A tank cars was increased from 11,000 gallons to 33,000 gallons. There was no analysis or full-scale testing of the consequences of crashes before these designs and equipment were placed into service.

"The accident history of the DOT 112A/114A tank cars has demonstrated safety shortcomings in their design, and increased losses to the public. The Safety Board has recommended safety changes to DOT 112A/114A tank cars since the accident in Laurel, Mississippi, in 1969. The Board concludes that the acceptance of DOT 112A/114A cars on special permits introduced an unreasonable risk to the public because safety assessments made at that time were inadequate.

"DOT issued new regulations for DOT 112A/114A tank cars addressing a more complete line of safety corrections; shelf couplers, head shields, and thermal protection were to be installed at various dates, the last of which was December 31, 1981. The installation deadlines for these safety corrections were later than demanded by the accidents and continuing risks.

"DOT's revised implementation schedule for DOT 112A/114A tank cars calls for installing shelf couplers by December 31, 1978, and head shields and thermal protection by various dates, the last of which is December 31, 1980. The installation dates are still later than technically feasible for head shields.

"DOT has a limited ability to insure that tank car owners comply as scheduled and the revised safety regulations are neither strengthened by strong incentives for accelerated implementation nor economic disincentives for delay."

Since the issuance of the report and recommendations, the Safety Board has continued to monitor the status of the tank car retrofit program and to encourage timely completion of tank car safety improvements.

On July 7, 1978, MTB officially accelerated the retrofit program. The completion deadline for shelf couplers was December 31, 1978, and the last of the completion deadlines for tank head and thermal protection was December 31, 1980.

The Safety Board's campaign for improved tank car safety was not limited to DOT 112/114 tank cars. Although the DOT 105 tank cars were smaller and in some ways better protected, the need for additional safety protection was graphically demonstrated in an accident near Youngstown, Florida, in 1978. Eight persons died and 135 were injured when chlorine gas was released from a derailed DOT 105 tank car that had been punctured by the corner of a derailed flatcar.

The Safety Board investigated the Youngstown accident and on November 22, 1978, recommended that DOT 105 tank cars be retrofitted with shelf couplers. Although coupler override and penetration was not the cause of the tank car puncture, investigators concluded that shelf couplers might have prevented the puncture by keeping the derailed cars more in line with the track. ("Derailment of Atlanta and St. Andrews Bay Railway Company Freight Train, Youngstown, Florida, February 26, 1978"; Report No. NTSB-RAR-78-7.)

On March 8, 1979, the Safety Board issued the report, "Safety Effectiveness Evaluation of the Federal Railroad Administration's Hazardous Materials and Track Safety Programs" (Report No. NTSB-SEE-79-2). The evaluation was performed pursuant to a directive from Conferees of the House and Senate that the Safety Board "conduct a thorough review of hazardous materials rail shipments and... determine how the Federal Railroad Administration (FRA) can more effectively prevent the occurrence and reduce the severity of derailments of hazardous materials." One of the safety recommendations resulting from the evaluation proposed train speed reductions in order to reduce the risk of derailments of unprotected DOT 112/114 tank cars.

DEPARTMENT OF TRANSPORTATION RESPONSIVENESS TO SAFETY BOARD RECOMMENDATIONS

On April 24, 1978, the Safety Board recommended that the Secretary of Transportation:

1. "Require that shelf couplers be installed on all DOT 112A/114A jumbo tank cars no later than December 25, 1978. (Class I, Urgent Action) (R-78-19).

2 "Require that approved head shields be installed on all DOT 112A/114A tank cars by December 25, 1978. (Class I, Urgent Action) (R-78-20).

3. "Require that thermal insulation be installed as soon as possible, but in no event later than the original deadline of January 1, 1982, contained in the Materials Transportation Bureau's Docket HM-144. (Class II, Priority Action) (R-78-21)."

As a result of its investigation of the Youngstown, Florida, accident, on November 22, 1978, the Safety Board recommended that the Secretary of Transportation:

> "Require that top and bottom shelf couplers be installed on all DOT 105 tank cars as soon as possible. (Class I, Urgent Action) (R-78-58)"

As a result of its "Safety Effectiveness Evaluation of the Federal Railroad Administration's Hazardous Materials and Track Safety Programs," on March 20, 1979, the Safety Board recommended that the Secretary of Transportation:

> "Require that all trains with placarded loaded tank cars of the 112A and 114A types not equipped with the required shelf couplers and tank head protection, which are loaded with liquefied flammable gases and other

liquids or toxic compressed gases, operate at a speed 10 mph less than the maximum speeds authorized for these trains on classes 3, 4, 5 and 6 tracks. (Class I, Urgent Action) (R-76-28)"

Under the amended retrofit schedule adopted by MTB for DOT 112/114 tank cars, all of the approximately 18,000 U.S. DOT 112/114 tank cars were required to be equipped with shelf couplers by December 31, 1978, (approximately 600 tank cars required shelf couplers only, or the A retrofit package). Tank cars used exclusively in anhydrous ammonia service are required to be retrofitted with headshields (the S retrofit package) by December 31, 1979, (now about 2,400 tank cars). Tank cars used to transport flammable gases such as propane, vinyl chloride, and butane (about 15,000 tank cars) must be equipped with both headshields and thermal protection by established dates. This requirement may be met by application of either separate headshields by December 31, 1979, and nonjacketed, spray-on thermal coating by December 31, 1980 (the T retrofit package), or jacketed thermal insulation with integral headshields (the J retrofit package); the owner may chose his option. The deadlines for the J retrofit are 65 percent completion of each owner's J tank cars by December 31, 1979, and 100 percent completion by December 31, 1980.

An additional rule, published in the Federal Register on September 7, 1978, requires that each tank car owner submit to FRA quarterly reports of the number of DOT 112/114 tank cars owned, the number planned for each retrofit package, and progress toward completing the required retrofits.

The current status of each of the above Safety Board recommendations under the current retrofit schedule and the reported status of retrofit completions are as follows:

Recommendation R-78-19.--In response to this recommendation, MTB in its final rule accelerated the deadline for the shelf coupler retrofit by 6 months, from July 1, 1979, to December 31, 1978.

In correspondence with the Secretary of Transportation, the Safety Board sought assurances that tank cars which were not retrofitted by the deadline date would be removed from service pending retrofit. The Secretary assured the Chairman of the Safety Board by letter on January 19, 1979, that the regulations would be enforced strictly.

On August 14, 1979, the Safety Board received an interim report from the Chief of the Hazardous Materials Division, FRA Office of Safety. This report indicated that the status of 17,493 DOT 112A/114A tank cars was as follows:

Total number of DOT 112A/114A cars reported	17,493
Shelf couplers installed	17,475
Percent of cars completed	99.9
In shop for coupler installation	18
Percent of cars in shop	0.1

As soon as the 33 remaining tank cars are retrofitted, the Safety Board will consider this recommendation "closed, acceptable action."

Recommendation R-78-20—In response to this recommendation, FRA and MTB accelerated the final deadline for installation of tank head protection by 1 year, from December 31, 1981, to December 31, 1980. The Safety Board advised the Department of Transportation on December 19, 1978, that this recommendation remains "open, unacceptable action."

The deadlines established by Department of Transportation were not based upon the ability of the industry to apply tank head protection as rapidly as possible. Installation of headshields on all DOT 112/114 tank cars by the end of 1978 was technically, financially, and logistically feasible. However, FRA and MTB decided to allow 2 additional years for completion to permit tank car owners to meet the headshield requirement by using the jacketed method of insulation -- which accomplishes thermal and tank head protection in a unitary process, but is far more time-consuming than installation of headshields alone and can be performed at only a small number of locations.

In the report of its public hearing, the Safety Board pointed out that the major accident problem was tank-head puncture and the risks required that puncture protection be given first priority. The report stated:

> If the industries involved wish to design elaborate safeguards, the Safety Board commends their efforts. However, thermal protection should be accomplished after headshields are effectively in place.

As a result of the failure of FRA and MTB to require installations of headshields on DOT 112/11 tank cars before instaliation of thermal protection, head protection has been delayed unnecessarily. It now appears that approximately 8,200 tank cars will not be required to have tank head protection until the December 31, 1979, and an additional 4,400 to 4,500 tank cars will not have to meet the requirement until December 31, 1980.

The status of headshield installations under the various retrofit schedules established by the Department of Transportation is as follows:

Cars subject to S retrofit:

Total number of cars reported	2,424
Completed as of July 1, 1979	1,698
Percent of cars completed	70.0

Cars subject to T retrofit:

Total number of cars reported	1,780
Completed as of July 1, 1979	634
Percent of cars completed	35.5

Cars subject to J retrofit:

Total number of cars reported	12,644
Completed as of July 1, 1979	5 787
Percent of cars completed	45.8

Apparently, owners of cars subject to the S and J retrofits can comply with the required completion dates. However, the Safety Board has advised FRA that it appears unlikely that the T retrofit can be completed by the established deadline.

FRA has indicated that the T retrofit is being delayed because of materials shortages and problems in the application of "spray-on" thermal insulation. FRA's position is that tank cars now subject to the T retrofit can shift to the S or the later J retrofit requirements. In fact, many tank cars which were formerly scheduled for the T retrofit have already shifted to the J schedule. The structure of the deadline requirements makes this shift possible without Department of Transportation approval. The retrofit regulation requires that tank car owners elect either the T or J retrofit for tank cars which require thermal protection as well as tank head protection. Owners were required to make that election in October 1978. That declaration, however, was not binding and the compliance reporting provisions specifically require that owners' elections be "updated" in the quarterly compliance reports to FRA.

The Safety Board is concerned that tank head protection for an increasing number of tank cars will be delayed beyond the end of 1979. FRA's compilation of retrofit declarations as of November 2, 1978, indicated that 3,324 tank cars would not have to be equipped with tank head protection until the end of 1980. However, as of August 13, 1979, that figure had increased by about one-third, or 1,100 tank cars. The Safety Board has no objection to the use of any method of thermal insulation which will meet the performance specifications established by the Department of Transportation. However, the Safety Board believes that exercise of the option to choose the method of insulation should not operate to further delay the accomplishment of tank head protection.

In a letter to the FRA Administrator, the Safety Board has indicated that additional delays in headshield installations as a result of shifting tank cars from the T to the J retrofit is unacceptable. FRA's actions do not reflect the urgency of the accident risks. As a result, tank cars carrying hazardous materials will remain vulnerable to tank-head puncture for a longer period, while railroad employees, emergency response teams, and the public will bear the risk of potential accident consequences.

Recommendation R-78-21--In response to this recommendation, MTB accelerated the thermal insulation final deadline by 1 year, from December 31, 1981, to December 31, 1980. The status of thermal insulation installations is as follows:

Cars subject to T and J retrofit:

Total number of cars reported	14,430
Completed as of July 1, 1979	6,421
Percent of cars completed	44.5

The Safety Board considers this recommendation "open, acceptable action." Upon determination that the retrofit has been completed, the recommendation will be closed.

Recommendation R-78-56.—In its response to this recommendation, FRA agreed that shelf couplers should be required on all DOT 105 tank cars. However, FRA believes that such a requirement should be part of a "total effort" which includes head protection, better structural strength, increased puncture resistance, and better thermal protection. FRA anticipated that a draft NPRM setting forth the above requirements would be sent to the Materials Transportation Bureau (MTB) in May, 1979. However, as of August 27, 1979, MTB had not received the draft NPRM, and thus, action is already 3 months overdue.

The Safety Board believes that the program intended by FRA is unacceptable. While the improvements contemplated by FRA are indeed desirable, there is no reason to delay promulgation of a shelf coupler requirement while other requirements are being developed. The broader scope of the retrofit program proposed by FRA will require a substantially longer period of time to complete, as experience with the T and J retrofit packages and preparation of the draft NPRM have demonstrated.

The Safety Board believes that a shelf coupler requirement for DOT 105 tank cars should be promulgated immediately, with other safety requirements to follow. To permit further delay in the application of a basic safety correction which is available is to invite another potentially serious disaster, such as the one at Youngstown. The status of this recommendation is "open, unacceptable action."

Recommendation R-79-28.—Under the 90-day time limit established for responding to Safety Board recommendations by Section 307 of the Independent Safety Board Act of 1974 (P.L. 93-633; 49 U.S.C. 1903), a response to this recommendation was due from the Secretary of Transportation by June 18, 1979. However, as of August 27, 1979, no response had been received.

This recommendation was issued because there was no indication that the relatively higher level of risk involved in transporting loaded hazardous materials tank cars had been considered in the establishment of track safety standards. The Inter-Industry Task Force on Rail Transportation of Hazardous Materials also recognized the increased risks when it recommended in its July 21, 1978, interim report to the railroads that speed restrictions be adopted. The need for such a safety measure becomes more urgent as more tank cars slip into the late 1980-deadline category for headshields. To date, most railroads have not acted upon the Inter-Industry

Task Force recommendation, and FRA has taken no action to implement the Safety Board's recommendation. FRA testimony before the Subcommittee on Transportation of the Senate Committee on Appropriations on May 16, 1979, suggested that the problem requires further study.

The Department of Transportation approach is inconsistent. On the one hand, it finds the problem of unprotected hazardous materials tank cars sufficiently compelling to adopt and accelerate a mandatory program for retrofitting safety equipment. On the other hand, the Department of Transportation appears not to consider the problem sufficiently compelling to warrant adoption of an interim speed reduction safety measure to reduce the risk of a catastrophic accident involving tank cars that have not yet been retrofitted.

The suggestion that further study is necessary again ignores the sense of urgency on which the retrofit program and its subsequent acceleration were based. Further study can mean only further delay while unprotected jumbo hazardous materials tank cars continue to operate at speeds designed for nonhazardous freight, at considerable risk to the public. The Safety Board cannot reconcile the Department's inconsistency.

In summary, the Board has made five safety recommendations to the Department of Transportation and the FRA dealing with safety modification of railroad tank cars carrying hazardous materials. Of these five recommendations, four were deemed by the Safety Board to be "Class I -Urgent Action" in nature, which the Board defines as follows: "Urgent commencement and completion of action is mandatory to avoid imminent loss of life or injury and/or extensive property loss." The remaining recommendation was categorized as "Class II - Priority Action," meaning "Priority commencement of action is necessary to avoid probable loss of life or injury and/or property loss."

Of the four Class I recommendations made, action by the Department of Transportation is adjudged by the Safety Board to be unacceptable on three. This judgment is based on the facts that: (1) As of July 1, 1979, even though substantial progress has been made, over 50 percent of the tank cars carrying hazardous materials are still not protected with headshields, (2) no alternate actions to expedite headshield retrofitting or require other safety precautions pending such retrofitting, such as requiring reduced speed or special handling for unretrofitted cars, has been taken and no response to the Safety Board from FRA has even been received, and (3) no action to extend an acknowledged safety feature, shelf couplers, to DOT 105 tank cars has been taken.

PERFORMANCE OF DOT 112/114 TANK CARS EQUIPPED WITH HEADSHIELDS AND/OR SHELF COUPLERS

In 1979 the Safety Board concluded its investigations of two train derailments involving DOT 112/114 tank cars equipped with headshields, shelf couplers or both. The investigations indicated that the safety equipment effectively protected against tank-head punctures in both accidents.

One of these accidents occurred 6 miles from Princeton, Kentucky, on October 17, 1978, and involved 16 cars containing Department of Transportation-regulated hazardous materials. Four of the 16 cars were DOT 112A tank cars and 1 was a DOT 114A tank car. The five DOT 112A/114A tank cars all were equipped with shelf couplers and all met Department of Transportation regulatory requirements. During derailment a number of tank cars and other freight cars were damaged; however, the tanks on DOT 112A and 114A tank cars were not breached and hazardous materials were not released.

Safety Board investigators determined that shelf couplers and/or headshields effectively p[illegible]ted against tank-head punctures by overriding couplers on all DOT 112 and 11[illegible] tank cars derailed in the accident.

The second accident occurred near Crestview, Florida, on April 8, 1979, and involved 26 tank cars containing Department of Transportation-regulated hazardous materials. Of the 26 tank cars, 4 were Department of Transportation 112S tank cars equipped with headshields and shelf couplers, and 2 were DOT 112A tank cars equipped with shelf couplers. All of the 112A and 112S tank cars met Department of Transportation regulatory requirements.

Some tank cars were damaged during the derailment. (See figure 3.) However, both 112A tank cars and three of the four 112S tank cars retained their contents. The only 112S tank car which released hazardous materials was severely damaged under the dynamics of impact, and neither shelf couplers nor headshields could have prevented release of the product because the dome housing cover became dislodged and the valve escapements distorted. The tank car rolled from the train trestle and became engulfed in fire, and the tank ruptured into three sections.

Safety Board investigators observed that the 112A and 112S tank cars sustained no tank head punctures in the derailment. The chairman of the hazardous materials group which investigated the accident reported that "head shields and shelf couplers protected the heads of all the DOT 112 and 105 derailed cars involved in this derailment against punctures."

The Safety Board has received an informal report of an unusual incident in which an interlocking Type F shelf coupler apparently supported a crippled tank car for about 100 miles after it had lost a truck. 2/ According to a July 10, 1979, report by officials of the Chicago, Rock Island, and Pacific Railroad Company:

> Yesterday after train 81A05 had pulled into Trenton [Missouri] yard, it was observed that a tank car with LPG was without one set of trucks. This car was coupled to another loaded LPG car with a shelf coupler. Tracks were patrolled backward towards Des Moines in an effort to develop where this car had lost its trucks. The trucks were found near Beech, Iowa -- 98 miles north of Trenton.

2/ A truck is a frame containing one or more pairs of wheels and springs to carry and guide one end of a railroad car.

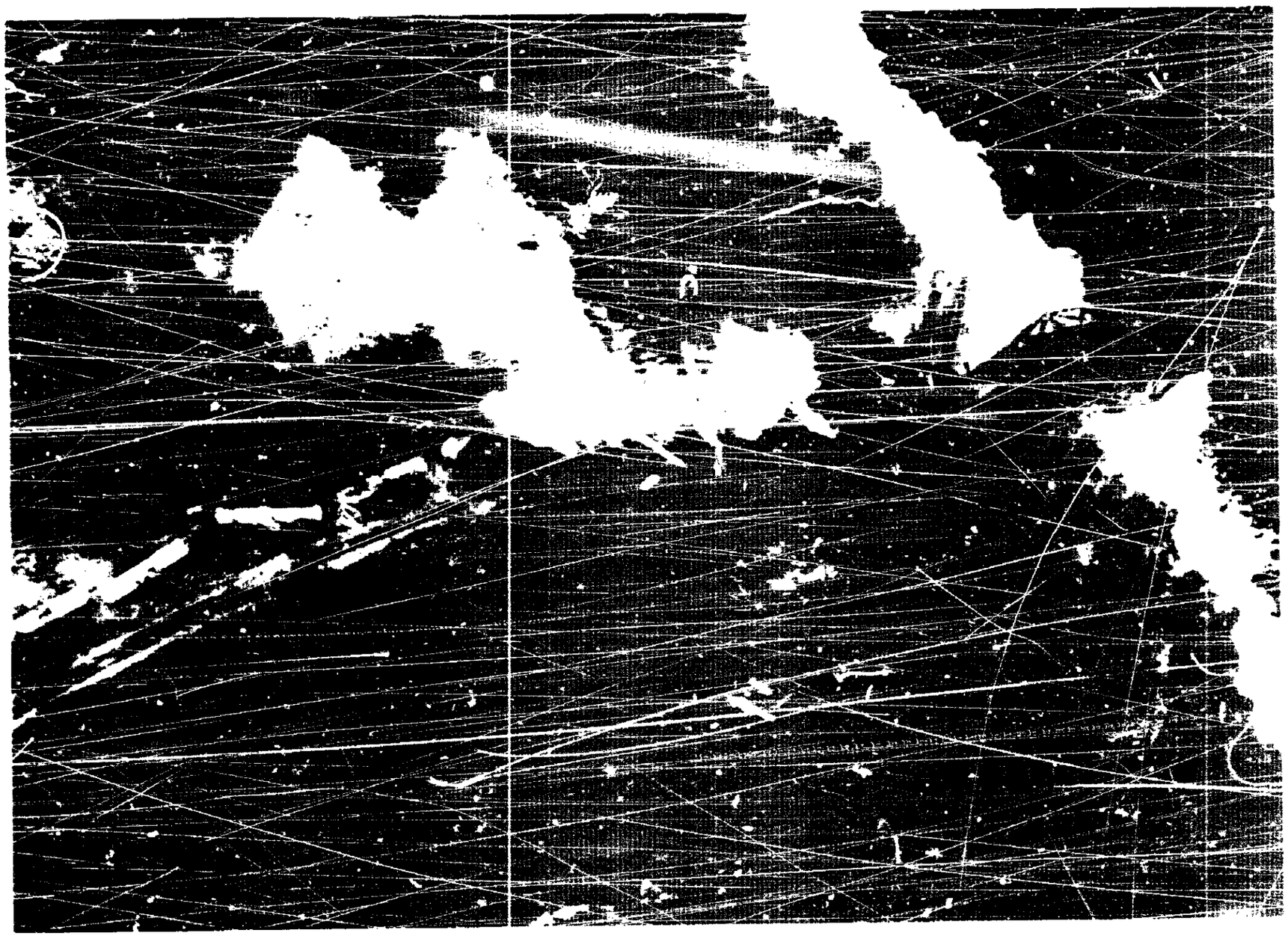

Figure 3. Aerial view of derailed tank cars near Crestview, Florida, April 8, 1979

A Safety Board accident investigator who examined the equipment reported that the shelf coupler had not disengaged even though it was severely bent from the tremendous weight of the loaded LPG tank car. (See figures 4 and 5). According to railroad officials, the interlocking feature of the Type F shelf coupler was apparently the only thing that prevented an accident when the truck separated from the tank car.

It is desirable that shelf couplers resist vertical separation, as they were designed to do. However, shelf couplers were not designed to support the weight of a loaded tank car, and additional control measures may be necessary to ensure that when this occurs, it does not create a hazardous condition of which the traincrew is not aware.

SUMMARY OF PROGRESS AND REMAINING PROBLEMS

Substantial progress has been made toward improving the safety of railroad transportation of hazardous materials. By bringing Government and industry officials together, the Safety Board has stimulated adoption of Federal regulations requiring safety modification of DOT 112/114 tank cars. Through its public hearing and recommendations, the Safety Board joined with the Congress in focusing national attention on the urgency of the tank car safety problem and in stimulating Department of Transportation action to accelerate the safety retrofit program. As a result, virtually all DOT 112/114 tank cars carrying hazardous materials on the Nation's railroads are now equipped with shelf couplers; nearly one-half of the DOT 112/114 U.S. tank car fleet is now equipped with headshields; and nearly one-half of the DOT 112/114 tank cars requiring thermal insulation are now insulated. While the Safety Board believes that these safety improvements could have been achieved even more rapidly than they have been, the risk to the public of catastrophic accidents involving hazardous materials tank cars has been reduced significantly.

While significant progress has been made toward improving the safety of railroad transportation of hazardous materials, several serious safety problems remain. In light of these problems, the Safety Board concludes that:

1. Until all tank cars which are subject to shelf coupler and headshield requirements are so equipped, trains transporting those tank cars should be operated at reduced speeds in order to reduce the risk of a potentially catastrophic accident. Department of Transportation has failed to act on or to respond to the Safety Board's recommendation in this area.

2. The rate of completion of tank car headshield installations in the T retrofit continues to be unacceptably slow. Because many tank car owners have changed their plans from the T to the J retrofit, the number of tank cars which are not required to have tank head protection until December 31, 1980, has increased by 1,100 to more than 4,400 tank cars. Therefore, the Safety Board recommends that the Secretary of Transportation:

Figure 4. Side view of LPG tank car with truck missing as it appeared upon arrival at Trenton, Missouri.

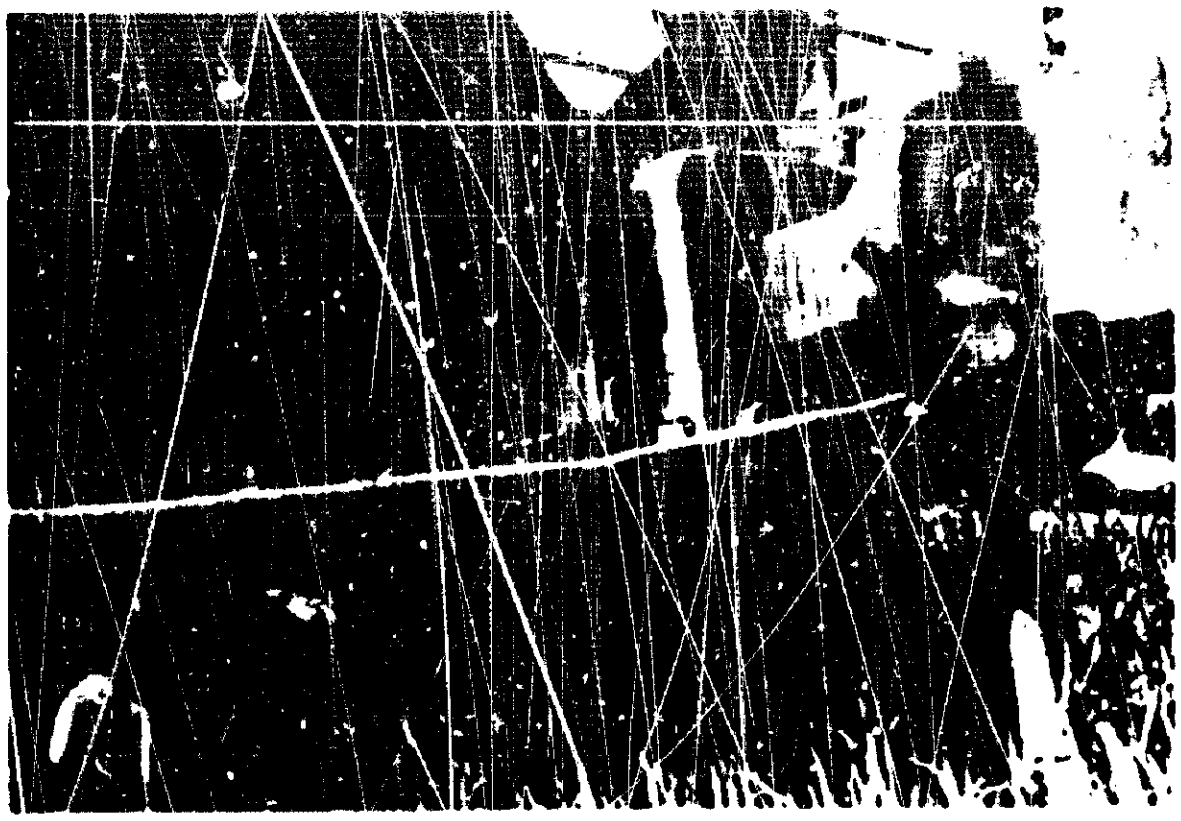

Figure 5. Side view of "F" shelf coupler on end of the tank car which had lost a truck. Note the angle of the drawbar and coupler, the result of carrying the tank car on the coupler. (The truck shown was placed under the tank car after its arrival at Trenton, Missouri.)

"Require that DOT Specification 112 and 114 tank cars which have been shifted from the T retrofit to the J retrofit be equipped with tank head protection by December 31, 1979. (Class I, Urgent Action) (R-79-65)"

"Provide that tank cars which have been shifted from the T retrofit to the J retrofit are not to be counted in the requirement for 65 percent retrofit completion of J tank cars by December 31, 1979. (Class I, Urgent Action) (R-79-66)"

3. With installation of shelf couplers on all DOT 112/114 tank cars virtually complete, this safeguard should now be applied to DOT 105 tank cars. Because of uncertainty over when FRA will act on the Safety Board's recommendation that FRA require DOT 105 tank cars transporting hazardous materials to be equipped with shelf couplers, the Safety Board recommends provide that the Secretary of Transportation:

Issue promptly a regulation to require that all DOT Specification 105 tank cars which transport hazardous materials be equipped with top and bottom shelf couplers by December 25, 1980. (Class I, Urgent Action) (R-79-67)'

Finally, on Recommendation No. R-79-28 the Department of Transportation exceeded the 90-day statutory time limit established by the Independent Safety Board Act of 1974 for responding to Safety Board recommendations. The Safety Board believes the time limits established in the law are reasonable and that its recommendations warrant reasonably timely review and a response indicating the Department of Transportation's intent to either implement or not implement the recommendations and their reasons therefor. The Safety Board will keep the Congress advised should this problem not improve in the near future.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ PATRICIA A. GOLDMAN
Member

/s/ G.H. PATRICK BURSLEY
Member

FRANCIS H. McADAMS, Member, did not participate.

September 13, 1979

END
DATE
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